What is claimed is:

1. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis; and

a crank having:

a crank pin,

a crank arm that transmits force between said crank pin and said power shaft, and

a first transducer coupled to said crank pin, the transducer comprising a first active area, which includes at least a first portion of an electroactive polymer and at least two first active area electrodes coupled to the first portion of the electroactive polymer.

2. The system of claim 1 wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said first active area electrodes.

3. The system of claim 1 further including a connecting rod that interconnects said electroactive polymer and said crank pin.

4. The system of claim 1 wherein the plane of said electroactive polymer is substantially parallel to said axis.

5. The system of claim 1 wherein said transducer is included in an actuator.

6. The system of claim 5 wherein said actuator applies translational motion to said crank pin, which in turn rotates said power shaft to provide power output thereon.

7. The system of claim 1 further including a second transducer operably coupled to said crank pin.

8. The system of claim 7 wherein said first transducer and said second transducer are arranged in a V about said power shaft, the V having an angle between about 0 degrees and 180 degrees.

9. The system of claim 7 wherein said first transducer and said second transducer are arranged in-line about said power shaft.

10. The system of claim 7 further including a disc that couples said first transducer and said crank pin and couples said second transducer and said crank pin.

11. The system of claim 1 wherein said crank is included in a plurality of cranks mounted concentrically on said power shaft, said plurality of cranks comprising a second crank, the second crank having:

a second crank pin

a second crank arm that transmits force between said second crank pin and said power shaft; and

a second transducer coupled to said crank pin, the second transducer comprising a first active area, which includes at least a first portion of a second electroactive polymer and at least two electrodes coupled to the first portion of the second electroactive polymer.

12. The system of claim 11 wherein said plurality of cranks are arranged substantially equally about said power shaft and arranged to rotate about said fixed axis.

13. The system of claim 11 wherein said first transducer is a first monolithic transducer and said second transducer is a second monolithic transducer.

14. The system of claim 11 wherein the active areas of the first monolithic transducer are offset from the active areas of the second monolithic transducer.

15. The system of claim 11 wherein deflection of said first electroactive polymer and said second electroactive polymer along a path provided by the crank arm is substantially

independent of elastic potential energy of said first electroactive polymer and said second electroactive polymer.

16. The system of claim 1 wherein the transducer comprises a second active area comprising at least two second active area electrodes and a second portion of the electroactive polymer coupled to the at least two second active area electrodes.

17. The system of claim 16 wherein the first and second active areas of the transducer are symmetrically arranged around said power shaft.

18. The system of claim 16 wherein the at least two first active area electrodes and the at least two second active area electrodes of the transducer are arranged radially around said power shaft.

19. The system of claim 16 wherein elastic potential energy stored in the second portion of said electroactive polymer during actuation of the second active area at least partially contributes to deflection of the first portion of said electroactive polymer.

20. The system of claim 16 wherein deflection of said electroactive polymer along a path provided by the crank arm is substantially independent of elastic potential energy of said electroactive polymer.

21. The system of claim 16 wherein one of the at least two first active area electrodes and one of the at least two second active area electrodes are in electrical communication.

22. The system of claim 21 wherein said one of the at least two first active area electrodes and said one of the at least two second active area electrodes are included in a common electrode.

23. The system of claim 16 wherein rotation of said power shaft is assisted by mechanical input energy.

24. The system of claim 1 wherein the electroactive polymer includes pre-strain.

25. The system of claim 1 further comprising a mechanism that assists rotation of the power shaft.

26. The system of claim 25 wherein the mechanism is a flywheel.

27. The system of claim 1 wherein said transducer is capable of rotating said power shaft in both rotational directions about said fixed axis.

28. The system of claim 1 wherein elastic return of said electroactive polymer contributes to rotation of said power shaft.

29. The system of claim 28 further comprising an external load that increases elastic strain of said electroactive polymer.

30. The system of claim 1 further including a bearing between said electroactive polymer and said crank pin that allows the electroactive polymer to rotate about said crank pin.

31. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about a fixed axis; and

a crank having:

a crank pin,

a crank arm that transmits force between said crank pin and said power shaft, and

a first transducer coupled to said crank pin, the transducer comprising a first active area, which includes at least a first portion of an electroactive polymer and at least two first active area electrodes coupled to the first portion of the electroactive polymer, wherein the electroactive polymer includes pre-strain.

32. The system of claim 31 wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said first active area electrodes.

33. The system of claim 31 wherein the plane of said electroactive polymer is substantially parallel to said axis.

34. The system of claim 31 wherein said electroactive polymer is a dielectric elastomer.

35. The system of claim 31 wherein said transducer is capable of rotating said power shaft in both rotational directions about said fixed axis.

36. The system of claim 31 further comprising an external load that increases elastic strain of said electroactive polymer.

37. A mechanical-electrical power conversion system comprising:
a power shaft configured to rotate about a fixed axis; and
a crank having:
a crank pin,
a crank arm that transmits force between said crank pin and said power shaft, and
a first transducer coupled to said crank pin, the transducer comprising a first active area, which includes at least a first portion of an electroactive polymer and at least two first active area electrodes coupled to the first portion of the electroactive polymer, wherein elastic return of said electroactive polymer at least partially contributes to rotation of said power shaft.

38. The system of claim 37 wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said first active area electrodes.

39. The system of claim 37 wherein said transducer is included in an actuator.

40. The system of claim 39 wherein said actuator applies translational motion to said crank pin, which in turn rotates said power shaft to provide power output thereon.

41. The system of claim 37 wherein said crank is included in a plurality of cranks mounted concentrically on said power shaft, said plurality of cranks comprising a second crank, the second crank having:

a second crank pin

a second crank arm that transmits force between said second crank pin and said power shaft; and

a second transducer coupled to said crank pin, the second transducer comprising a first active area, which includes at least a first portion of a second electroactive polymer and at least two electrodes coupled to the first portion of the second electroactive polymer.

42. The system of claim 41 wherein said plurality of cranks are arranged substantially equally about said power shaft and arranged to rotate about said fixed axis.

43. The system of claim 41 wherein said first transducer is a first monolithic transducer and said second transducer is a second monolithic transducer.

44. The system of claim 41 wherein the active areas of the first monolithic transducer are offset from the active areas of the second monolithic transducer.

45. The system of claim 41 wherein deflection of said first electroactive polymer and said second electroactive polymer along a path provided by the crank arm is substantially independent of elastic potential energy of said first electroactive polymer and said second electroactive polymer.

46. The system of claim 37 wherein the transducer comprises a second active area comprising at least two second active area electrodes and a second portion of the electroactive polymer coupled to the at least two second active area electrodes.

47. The system of claim 46 wherein the first and second active areas of the transducer are symmetrically arranged around said power shaft.

48. The system of claim 46 wherein the at least two first active area electrodes and the at least two second active area electrodes of the transducer are arranged radially around said power shaft.

49. The system of claim 46 wherein elastic potential energy stored in the second portion of said electroactive polymer during actuation of the second active area at least partially contributes to deflection of the first portion of said electroactive polymer.

50. The system of claim 46 wherein deflection of said electroactive polymer along a path provided by the crank arm is substantially independent of elastic potential energy of said electroactive polymer.

51. The system of claim 37 further comprising an external load that increases elastic strain of said electroactive polymer.

52. The system of claim 31 wherein said electroactive polymer is a dielectric elastomer.

53. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis; and

a crank having:

a crank pin,

a crank arm that transmits force between said crank pin and said power shaft, and

a first transducer coupled to said crank pin, the transducer comprising a first active area, which includes at least a first portion of an electroactive polymer and at least two first active area electrodes coupled to the first portion of the electroactive polymer, wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said first active area electrodes.